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ABSTRACT

A study was conducted to determine if Navy authors of instructional material could create effective memory aids for use in rote learning of material. A guidebook published by the Training Analysis and Evaluation Group was used in creating the memory aids. Navy school personnel used the guidebook to develop two training booklets incorporating memory aids. One booklet taught telephone codes for sound-powered phones to sailors in apprentice training school. The other booklet taught sailors how to recognize and respond to ten common navigation buoys. The booklets were evaluated in a classroom setting. Test scores for trainees who used the memory aids were much higher than the scores of trainees who were taught in the traditional way; study time was reduced by half. In the case of buoys, the group taught using memory aids scored 93 percent on the test as compared to 51 percent for the group taught using the traditional technique. In the case of the phone circuit code names, the group taught using memory aids scored 84 percent on the test compared to 63 percent for the group taught using the traditional technique. The study further verified the widespread knowledge that memory aids are beneficial in increasing student performance in rote learning situations, and it demonstrated that given adequate guidelines, memory aids can be developed by school personnel who have not had previous training in this activity. (Author/KC)

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Technical Memorandum 80-7

FIELD TEST OF GUIDELINES FOR THE DEVELOPMENT OF MEMORY AIDS IN TECHNICAL TRAINING

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Seaman Apprentice Training
Recruit Training Command Orlando

December 1980

CE 027 830

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FEB 16 1981

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

The purpose of this study was to determine if Navy authors of instructional material could create effective memory aids for use in rote learning of material. A guidebook published by the Training Analysis and Evaluation Group was used in creating the memory aids.

Navy school personnel used the guidebook to develop two training booklets incorporating memory aids. One booklet taught telephone codes for sound powered phones to sailors in Apprentice Training School. The other booklet

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taught sailors how to recognize and respond to 10 common navigation buoys. The booklets were evaluated in a classroom setting.

Technical Memorandum 80-7

TABLE OF CONTENTS

Section		Page
I	INTRODUCTION	3
	Purpose	3
	Organization of this Report	4
II	WRITING AND TESTING THE MEMORY AIDS	5
	Approach	5
	Development of Booklets	5
	Experimental Design	7
III	SUMMARY	9
	Results	9
	Conclusions	9
REFERENCES		11
APPENDIX A	Aids to Navigation	A-1
APPENDIX B	Proper Use of Sound Powered Phones	B-1
APPENDIX C	Tests Used in the Evaluation	C-1

LIST OF TABLES

Table		Page
1	Experimental Design	7
2	Test Scores of Trainees Taught in the Traditional Way and with Memory Aids	9

LIST OF ILLUSTRATIONS

Figure		Page
1	Example of Material from Proper Use of Sound Powered Phones (Phone Circuit Codes) and TAEG Report No. 60 (Morse Code)	6

SECTION I

INTRODUCTION

Rote memory has been traditionally used in military training for a wide range of skills. Operational experience in Navy schools has shown that students have difficulty in learning tasks which involve heavy dependence on rote memory. In today's all volunteer force environment, the problems with rote learning are becoming acute with the influx of lower aptitude students and the increasing number of recruits who speak English as a second language.

One way of enhancing the rote learning of material is through the use of well designed memory aids. There is considerable evidence from operational practice and from the research literature that employing these aids can make rote learning easier. Unfortunately, memory aids have rarely been systematically utilized in Navy technical training. Until recently, no standard guidelines have existed on how to create memory aids for instructional materials, and no directives have been promulgated requiring their use.

Recent work in support of military instructional systems development has provided a way to incorporate these aids in curriculum design. A requirement for the systematic use of memory aids has been stated in the Interservice Procedures for Instructional Systems Development (1975). (See also Aagard and Braby, 1975.) In addition, Braby, Kincaid, and Aagard (1978) have prepared a guidebook in support of the interservice procedures to design effective memory aids to teach difficult to recall information.[1] During the development of this guidebook, memory aids were created for use in the Navy Signalman School, Orlando, and the Navy Recruit Training Program. In addition, the memory aids for the Morse code portion of signalman training were field tested by Ainsworth (1979). Braby, et al. (1978) and Ainsworth (1979) indicated:

- Mnemonic type memory aids should be used to learn symbols, numbers, codes, lists, and other difficult to memorize types of specific information, not logically organized, that must be recalled accurately at a later time.

- Standard mnemonics developed by the authors of training materials can be used effectively by Navy students.

What was not established was whether Navy school personnel could use the guidebook to author effective memory aids.

PURPOSE

The purpose of this study is to determine if Navy authors of instructional material can utilize the guidebook published by the Training Analysis and Evaluation Group (TAEG) to create effective memory aids for technical training materials. This was accomplished by having enlisted authors (who were also lead instructors) use the guidebook to develop memory aids for selected training topics. These were then evaluated in the classroom setting.

[1] Similarly, Griffith (1979) has prepared a list of memory aid techniques appropriate to military training.

ORGANIZATION OF THIS REPORT

In addition to this introduction, the report contains two sections and three appendices. Section II describes the development of the memory aids and the method used to compare them with the traditional (blackboard) method of teaching the same material. Section III summarizes the results and conclusions of the study. Appendices A and B contain the training booklets, Aids to Navigation and Proper Use of Sound Powered Phones, respectively. Appendix C presents the tests used in the evaluation.

SECTION II

WRITING AND TESTING THE MEMORY AIDS

This section describes the development of two training booklets incorporating memory aids and the subsequent testing of these booklets. Both were written by Navy personnel responsible for curriculum development and evaluation at the Seaman Apprentice Training School, Orlando.

APPROACH

This effort provides a demonstration of the capability of school personnel to design memory aids using prescribed quidelines and to use these products in the classroom setting. To achieve this, designated school personnel (1) selected learning tasks that could be supported with memory aids, (2) designed memory aids for these learning tasks, and (3) compared the performance of students taught with and without the memory aids.

Since the advantages of memory aids in training tasks involving rote learning are well understood and documented, the intent of this study was simply to determine if effective memory aids could be designed by Navy school personnel.

DEVELOPMENT OF BOOKLETS. Selection of the topics for the booklets was guided by the work of Braby, Kincaid, and Aagard (1978), hereafter referred to as TAEG Report No. 60.

The Seaman Apprentice Training School teaches several topics which must be learned by rote memory. Perhaps the most difficult is rules of navigation including how to recognize and respond properly to buoys. The first booklet, Aids to Navigation, provided in appendix A, uses memory aids to teach trainees how to recognize and respond to 10 commonly encountered buoys.

The second booklet, Proper Use of Sound Powered Phones, provided in appendix B, uses memory aids to teach the code letter names of frequently used telephone circuits aboard ship. For example, "JA" is the code name for the "Captain's Battle Station" circuit. Like buoys, these codes have been difficult for Navy trainees to learn. (The booklet in appendix B also teaches proper procedures for telephone talkers but since these procedures are not taught with memory aids, they were not evaluated.)

TAEG Report No. 60 was used as a self-study guide for writing the memory aids contained in the two booklets. In addition, it was used as the model for formatting the instructional materials. The format of the memory aids to teach names and uses of buoys is similar to the format of the memory aids in the Morse code training package (appendix A of TAEG Report No. 60). As can be seen in figure 1, both contain a visual memory aid together with a verbal description in the middle column. The symbol (or code) and its name are shown in either the right or left column.

The first draft of each booklet consisted of rough art work and handwritten

PHONE CIRCUIT CODES

CIRCUIT	MEMORY AID	FULL NAME
JG	JG = GET CONTROL OF THAT AIRCRAFT	AIRCRAFT CONTROL CIRCUIT
JS	JS = SURVEILLANCE	SURVEILLANCE CIRCUIT

MORSE CODE

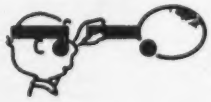
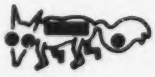
Definition	Memory Aid	Symbol
C	CHARLIE Brown 	-.-.
F	FOX TROTting 	..-.

Figure 1. Example of Material From Proper Use of Sound Powered Phones (Phone Circuit Codes) and TAEG Report 60 (Morse Code). Note the similarity in format.

text which was informally evaluated by Navy instructors, TAEG personnel,[2] and Navy apprentice trainees. Suggestions were incorporated and a test booklet containing quality art work and typed text was produced and printed.

EXPERIMENTAL DESIGN

The experimental design, shown in table 1, consisted of a direct comparison of performance following training in the traditional way (control group) and using memory aids developed by enlisted instructor personnel (experimental group). Separate experiments were conducted on telephone circuit code names and on the use of buoys.

TABLE 1. EXPERIMENTAL DESIGN

Topic	Training Technique	
	Memory Aids (Experimental Groups)	Traditional (Control Groups)
Phone Circuit Codes	Group I (N = 39)	Group II (N = 39)
Use of Buoys	Group III (N = 49)	Group IV (N = 50)

Students in four classes of the Seaman Apprentice Training School, Orlando, served as subjects. In all, 177 students took part in the study. Thirty-nine were taught telephone circuit code names using memory aids (Group I) and 39 learned the same material in the traditional way (Group II). Forty-nine were taught the use of buoys with memory aids (Group III) and 50 learned the same material in the traditional way (Group IV). Each group in the study was a class currently undergoing training. Class size was not fixed, hence the differences in number of students in each study group.

Trainees in the two control groups were taught telephone circuit code names or use of buoys in the traditional way. In Group II codes for telephone circuits and their names were written as a list on the board as the instructor explained the function of each. Trainees were then given 20 minutes to memorize them. Trainees in Group IV used magnetic replicas of the 10 buoys contained in the Aids to Navigation booklet. These were placed on a board over a drawing of the channel. Instructors explained the proper way to respond to each of the buoys in a lesson that lasted 40 minutes.

The two experimental groups were given the booklets and brief instructions on their use. Trainees learning telephone circuit code names averaged 10 minutes to learn the 10 circuits. Trainees studying buoys averaged 20 minutes to learn the material contained in Aids to Navigation.

[2]While TAEG personnel reviewed the output of the writers, there was minimal need for revision of the material. TAEG Report No. 60 provided sufficient guidance so that additional assistance was not required.

For each topic, the trainees in the control groups (i.e, taught in the traditional way) were tested before the experimental groups (taught with the material using the memory aids). No booklets were released prior to the control group test, even to instructors. This insured that control group trainees would not have access to the memory aids.

SECTION III

SUMMARY

This section presents the test score results for apprentice trainees taught use of buoys and phone circuit code names in the traditional way and with the use of memory aids. In addition, the utility of memory aids in instructional material design is discussed.

RESULTS

Test scores of the four student groups in the study are shown in table 2.

TABLE 2. TEST SCORES OF TRAINEES TAUGHT IN THE TRADITIONAL WAY AND WITH MEMORY AIDS

Topic	Training Techniques	
	Memory Aids	Traditional
Phone Circuit Codes	84%* (8.39 items correct out of a total of 10)	63%* (6.32 items correct out of a total of 10)
Use of Buoys	93%* (13.02 items correct out of a total of 14)	51%* (7.14 items correct out of a total of 14)

* Percentages of items correct on test

Test scores for trainees who used the memory aids were much higher than the scores of trainees who were taught in the traditional way; study time was reduced by half. In the case of buoys, the group taught using memory aids scored 93 percent on the test as compared to 51 percent for the group taught using the traditional technique. In the case of the phone circuit code names, the group taught using memory aids scored 84 percent on the test compared to 63 percent for the group taught using the traditional technique.

A t test between the test means of the "buoys" experimental and control groups showed a statistically significant difference ($t = 7.46$, p .001). A t test between the test means of the "phone circuits" experimental and control groups also showed a significant difference ($t = 4.20$, p .001).

CONCLUSIONS

The present brief study further verifies the widespread knowledge that memory aids are beneficial to increase student performance in rote learning situations. In addition, it demonstrated that given adequate guidelines, memory aids can be developed by school personnel who have not had previous training in this activity. It should be noted that the test was of limited scope. It involved the development of only two booklets and a simple experimental demonstration of

their value in a Navy school situation.

Since in this instance school personnel were able to create useful memory aids using the guidelines in TAEG Report No. 60, it is proposed that professional designers of instructional material in the Navy's Instructional Program Development Centers should have similar success using that report. In doing this, they will comply with the Interservice Procedures for Instructional Systems Development which specifies the use of memory aids in various types of job-task training.

REFERENCES

Aagard, J. A. and Braby, R. Learning Guidelines and Algorithms for Types of Training Objectives. TAEG Report No. 23. March 1976. Training Analysis and Evaluation Group, Orlando, FL. (ADA023066)

Ainsworth, J. S. Symbol Learning in Navy Technical Training: An Evaluation of Strategies and Mnemonics. TAEG Report No. 66. January 1979. Training Analysis and Evaluation Group, Orlando, FL. (ADA068041)

Braby, R., Kincaid, J. P., and Aagard, J. A. Use of Mnemonics in Training Materials: A Guide for Technical Writers. TAEG Report No. 60. July 1978. Training Analysis and Evaluation Group, Orlando, FL. (ADA064218)

Griffith, D. A Review of the Literature on Memory Enhancement: The Potential and Relevance of Mnemotechnics for Military Training. ARI Technical Report 436. December 1979. U.S. Army Research Institute for Behavioral and Social Sciences, Alexandria, VA.

Interservice Procedures for Instructional Systems Development, Phase III Develop. NAVEDTRA 106A, 1 August 1975.

APPENDIX A

AIDS TO NAVIGATION

This appendix contains the booklet Aids to Navigation written by Navy enlisted personnel (one of them a lead instructor) at the Seaman Apprentice Training School, Recruit Training Command, Orlando.

AIDS TO NAVIGATION

SEAMAN APPRENTICE TRAINING

RECRUIT TRAINING COMMAND

ORLANDO, FL.

PORT CHANNEL BUOY
A black odd numbered buoy.

PURPOSE
To mark the port (left) side of a channel coming from seaward.

STARBOARD CHANNEL BUOY
A red even numbered buoy.

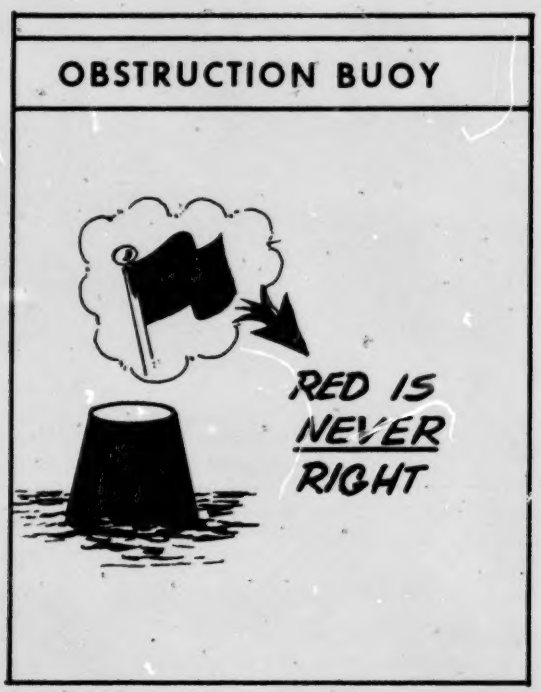
PURPOSE
To mark the starboard (right) side of a channel coming from seaward.

OBSTRUCTION BUOY
A red and black horizontal striped buoy. When top band is black, the preferred channel is to the starboard (right) side of the buoy.

PURPOSE
To mark obstructions in channel and indicate which side the best water is on.

OBSTRUCTION BUOY
A red and black horizontal striped buoy. When top band is red, the preferred channel is the port (left) side of the buoy.

PURPOSE
To mark obstructions in channels and indicate which side the best water is on.

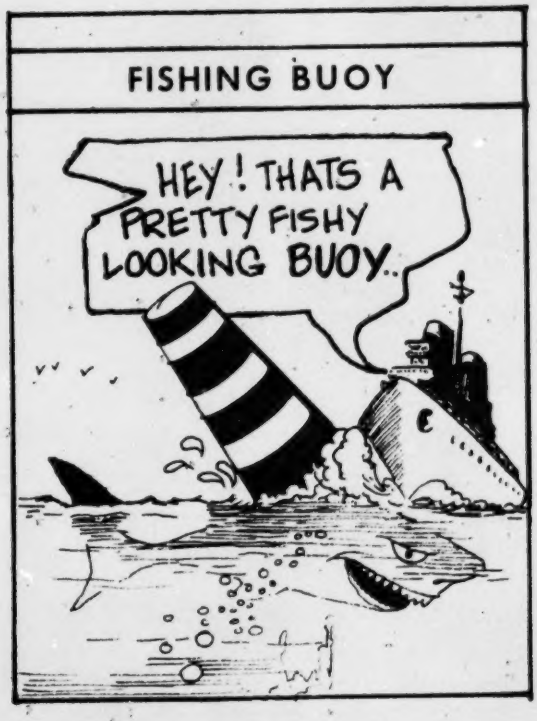


MID CHANNEL BUOY
A black and white vertical striped buoy.

PURPOSE
To mark the middle of channel.

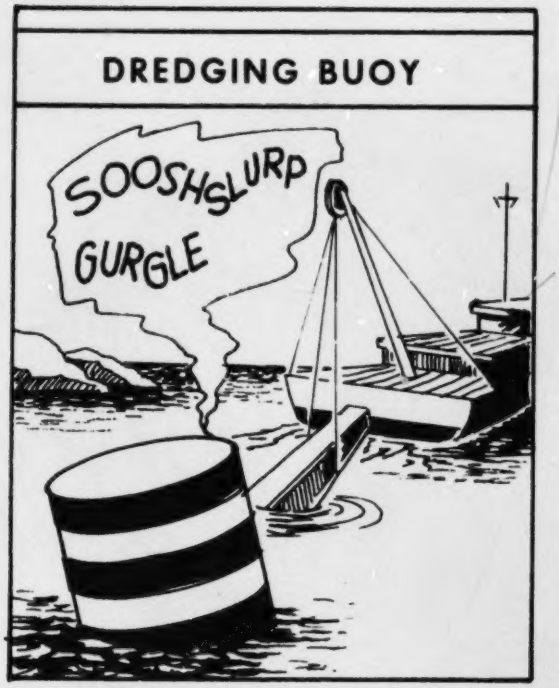
FISHING BUOY
A black and white horizontal striped buoy.

PURPOSE
To indicate fish nets are rigged. Ships and small craft stay clear.



DREDGING BUOY
A green and white horizontal striped buoy.

PURPOSE
To mark an area and equipment for dredging operation. (Dredge) A vessel used for deeping a channel.



ANCHORAGE BUOY
A solid white buoy.

PURPOSE
Marks areas for ship anchorages.

QUARANTINE BUOY
A solid yellow buoy.

PURPOSE
Marks area for ship anchorage that must remain clear of contact with other vessels or personnel. STAY AWAY !!!

SPECIAL PURPOSE BUOY
An orange and white horizontal striped buoy.

PURPOSE
To set aside areas for special operations:
Boat Shows
Cable Installation
across channels.

Name each of these buoys. If you do not know the answer turn to next page.

(black)

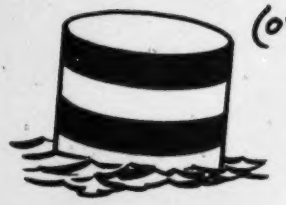
(yellow)

(white)

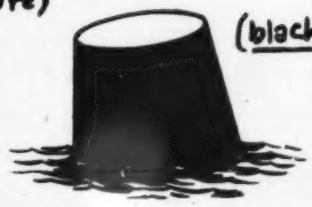
(red and black)

(green and white)

(black and white)



(orange and white)



(black and red)

(red)

(black and white)

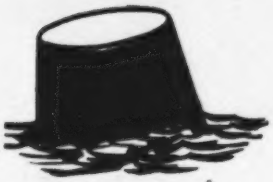
23

ANSWERS

PORT CHANNEL BUOY

QUARANTINE BUOY

ANCHORAGE BUOY

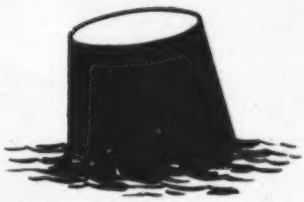


OBSTRUCTION BUOY

DREDGING BUOY

MID CHANNEL BUOY

SPECIAL PURPOSE BUOY



OBSTRUCTION BUOY

STARBOARD CHANNEL BUOY

FISHING BUOY

APPENDIX B

PROPER USE OF SOUND POWERED PHONES

This appendix contains the booklet Proper Use of Sound Powered Phones written by the two lead instructors at the Seaman Apprentice Training School, Recruit Training Command, Orlando.

PROPER USE OF SOUND POWERED PHONES

BMC H. ELAM
BMCS J. MARTIN

SEAMAN APPRENTICE TRAINING
RECRUIT TRAINING COMMAND
ORLANDO, FLA.

SOUND POWERED PHONE SYSTEMS

The first system is the primary system.
The primary system always starts with the letter "J."

"J" as in Junior = Junior is in primary training.

"J" indicates a primary system.

The primary circuit includes all circuits necessary for controlling - D A M E S.

Damage Control

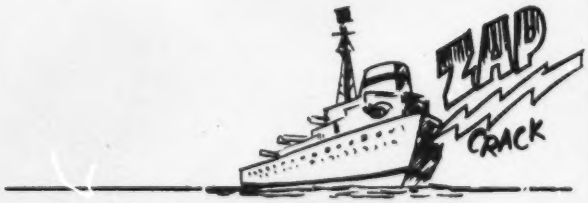
Armament

Maneuvering and Docking

Engineering

Surveillance Functions during Battle

CIRCUIT	MEMORY AID	FULL NAME
JA	JA = ALL HANDS, THIS IS THE CAPTAIN. MAN YOUR BATTLE STATIONS!	CAPTAIN'S BATTLE CIRCUIT
JC	JC = CONTROL WEAPONS	WEAPONS CONTROL CIRCUIT
JF	JF = FLAG OFFICER	FLAG OFFICER'S CIRCUIT

CIRCUIT	MEMORY AID	FULL NAME
JG	JG = GET CONTROL OF THAT AIRCRAFT	AIRCRAFT CONTROL CIRCUIT
JS	JS = SURVEILLANCE	SURVEILLANCE CIRCUIT
1JV	JV = VICTORY	MANEUVERING AND DOCKING CIRCUIT
JW	JW = WATER, WATER EVERYWHERE	SHIP'S CONTROL NAVIGATION CIRCUIT
JX	JX = XPLAIN	RADIO AND SIGNAL CIRCUIT
JZ	JZ = ZAP 	DAMAGE CONTROL CIRCUIT
JL	JL = LOOKOUT FOR EVERYTHING	LOOKOUT CIRCUIT

Practice Defining the Symbols

JA	JF	JS	1JV	JW	JZ	JC	JL	JS	JX	JG
JZ	JW	JG	JS	JF	JA	JC	1JV	JL	JC	JA
JZ	JX	JW	1JV	JS	JL	JX	JC	JA	JZ	JX
JA	JC	JF	JL	JS	1JV	JF	JW	JX	JF	JZ

Answers

JA = Captain's Battle Circuit
JC = Weapons Control Circuit
JF = Flag Officer's Circuit
JL = Lookout Circuit
JG = Aircraft Control Circuit
JS = Surveillance Circuit
1JV = Maneuvering and Docking Circuit
JW = Ship's Control Navigation Circuit
JX = Radio and Signal Circuit
JZ = Damage Control Circuit

RULES FOR THE TELEPHONE TALKERS

1

PRESS MOUTHPIECE TO TALK

Remember - Release the button when you are not talking.

2

HOLD MOUTHPIECE CLOSE TO YOUR LIPS

Hold the mouthpiece not more than one half inch from your mouth.

3

TALK CLEARLY

Pronounce every syllable distinctly.

4

USE STANDARD PHRASEOLOGY

Memorize the phonetic alphabet and pronunciation of numerals.

5

TALK S-L-O-W-L-Y

Pronounce every syllable in each word -
but do not have long pauses between words.

6

TALK LOUDLY

A loud voice will provide the power to activate the set.

7

ALWAYS MAINTAIN CIRCUIT DISCIPLINE

There is no room for idle conversation.

STEPS TO REMEMBER
FOR TELEPHONE TALKERS

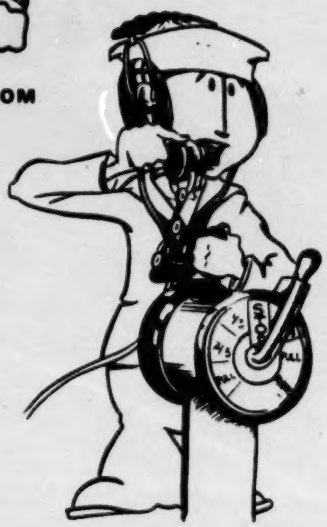
1. PRESS MOUTHPIECE TO TALK
2. HOLD MOUTHPIECE CLOSE TO YOUR LIPS
3. TALK CLEARLY
4. USE STANDARD PHRASEOLOGY
5. TALK SLOWLY
6. TALK LOUDLY
7. ALWAYS MAINTAIN CIRCUIT DISCIPLINE

STANDARD TELEPHONE TALKING PROCEDURES

"BRIDGE-
FORWARD ENGINE ROOM
"CHANGING PHONE
TALKERS...."

1 Send your message in this manner:

A. Name the station you are calling.
B. Identify your own station.
C. Send your message without undue waiting for other stations to answer.



"BRIDGE, AYE, AYE"

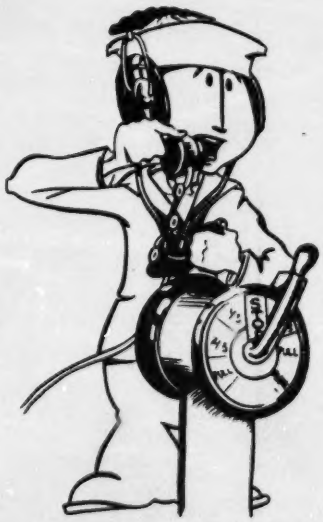
2 Acknowledge message sent to you.

This is to show you understand.

3 If you do not understand the message, say only "Say Again."

No other words are necessary and all other words are incorrect.

"BRIDGE-
FORWARD ENGINE ROOM
-REQUEST PERMISSION
TO BLOW TUBES...."



"BRIDGE, AYE, AYE, WAIT."

4 If you do not have the answer to a question, acknowledge and say "Wait."

Call back as soon as you get an answer.

34

APPENDIX C

TESTS USED IN THE EVALUATION

This appendix contains the two tests used in the study. (The answers are shown in parentheses.)

Technical Memorandum 80-7

AIDS TO NAVIGATION QUIZ

1. How are port channel buoys numbered coming from seaward? (odd)

2. What is the color of the port channel buoy? (black)

3. How is the starboard channel buoy numbered? (even)

4. What is the purpose of a red even-numbered buoy? (to mark the starboard side of a channel coming from seaward)

5. What are the colors and markings of an obstruction buoy? (black and red horizontal stripes)

6. When the top band of an obstruction buoy is red, on which side is the preferred channel (coming from seaward)? (port or left)

7. When the top band of an obstruction buoy is black, on which side is the preferred channel (coming from seaward)? (starboard or right)

8. What is the purpose of a mid-channel buoy? (to mark the mid-point of a channel)

9. What are the colors and markings of a mid-channel buoy? (black and white vertical stripes)

10. What are the colors and markings of a fishing buoy? (black and white horizontal stripes)

11. What are the colors and markings of a dredging buoy? (green and white horizontal stripes)

12. What does a white buoy mark? (areas of ships anchorages)

13. What does a solid yellow buoy mark? (quarantine)

14. What are the colors and markings of the special purpose buoy? (orange and white horizontal stripes)

Technical Memorandum 80-7

SOUND POWERED PHONE CIRCUITS QUIZ

FILL IN ALL BLANKS. THERE IS ONLY ONE CORRECT ANSWER PER QUESTION.

1. The Captain's Battle Circuit is designated as the ___(JA)___ circuit.
2. The Weapons Control Circuit is designated as the ___(JC)___ circuit.
3. The JF Circuit is the (Flag Officer's) circuit.
4. The Aircraft Control Circuit is designated as the ___(JG)___ circuit.
5. The Surveillance Circuit is designated as the ___(JS)___ circuit.
6. The circuit used when a ship is getting underway is the ___(1JV)___ circuit.
7. The Ship's Control Navigation Circuit is designated as the ___(JW)___ circuit.
8. The Radio and Signal Circuit is designated as the ___(JX)___ circuit.
9. The circuit used for damage control is the ___(JZ)___ circuit.
10. The circuit used by lookouts is designated as the ___(JL)___ circuit.

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